An OSSE Investigating a Constellation of 4- 5(.8) µm Infrared Sounders-----(Selections for IWW14)

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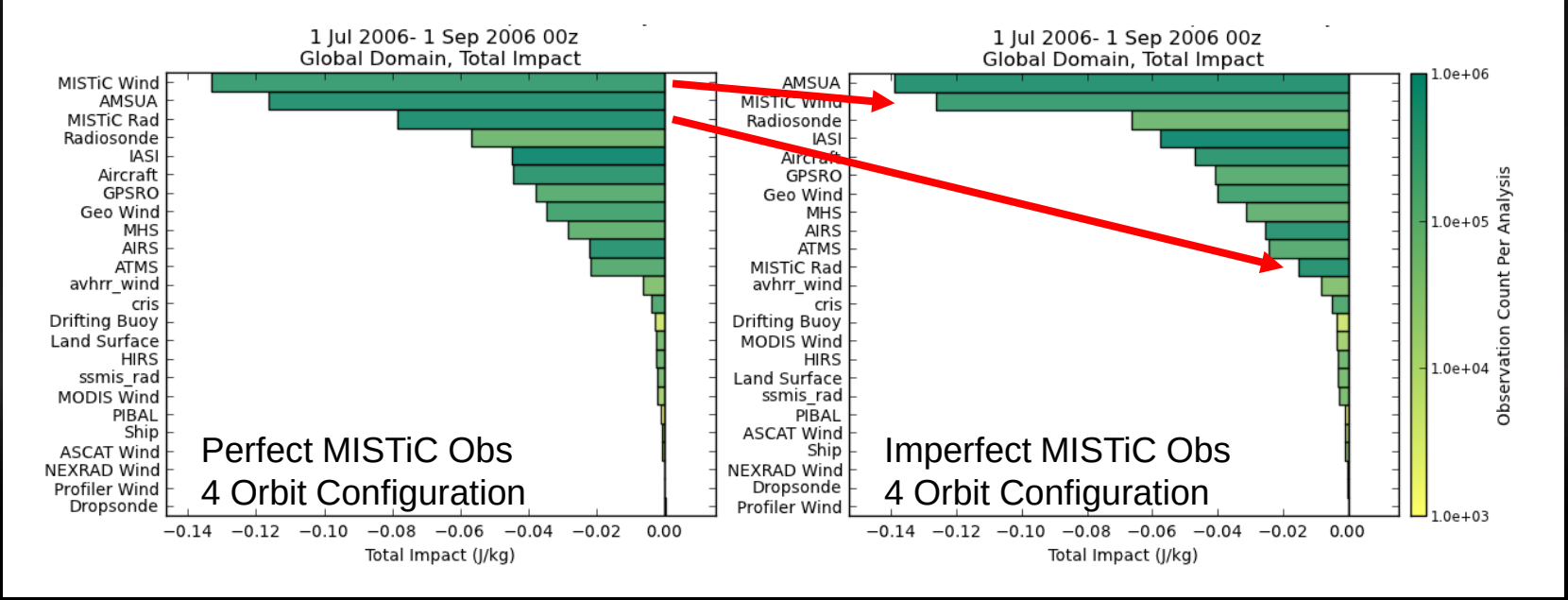
Forecast Impact (FSOI Metric)

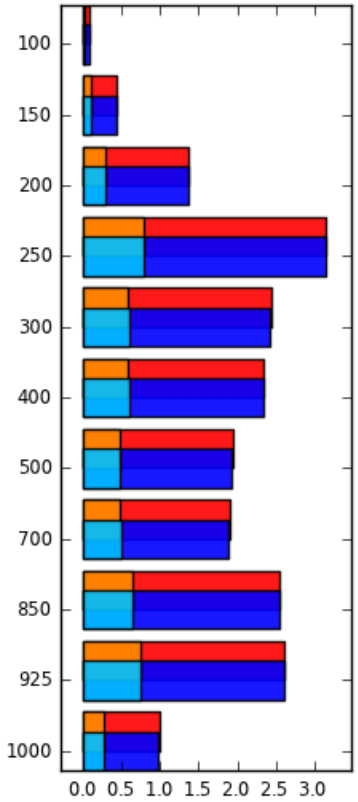


MISTiC Winds observations have a substantial impact on the skill of 24-hour forecasts, traced using an adjoint-based impact tool. Adding observation errors, MISTiC Winds wind data maintain high impact, while the impact of the radiances drops substantially in the "mix"

(Radiance impact drop due to RT shortcomings in 'imperfect' observations, recoverable w/ development)

Impact of MISTiC Wind AMVs

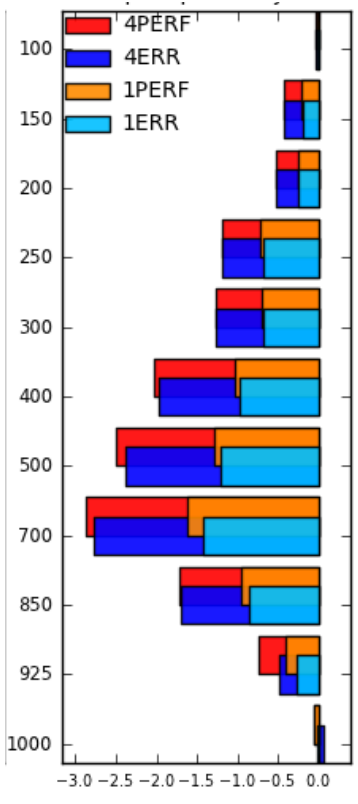
No of Obs used (millions)



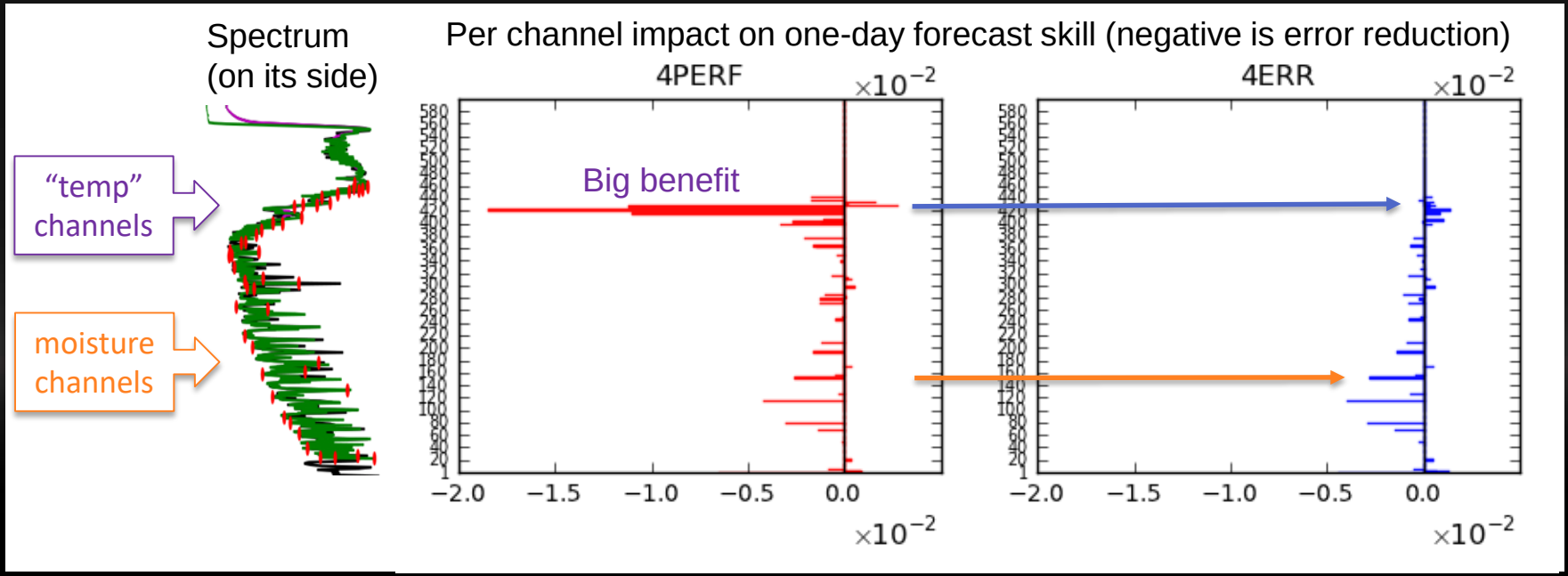
Cloud and WV AMVs combined

- The MISTiC Winds sampling strategy results in a consistent distribution of observations through troposphere
- The OSSE demonstrates that the highest impact of MISTiC Winds measurements comes from middle troposphere
- It is the winds derived from water-sensitive radiances that are the most impactful

Impact per Obs (negative is good!)



FSOI Metric for the MISTiC Winds Spectral Radiances



Moisture channels: beneficial impacts persist from "perfect" to "imperfect" case

Temperature channels: large beneficial impact in "perfect" observation scenario turns around when errors are introduced – main uncertainty here is in radiation transfer model – this is not a limitation of the observation concept and will be addressed

Summary of Main Results

- This GEOS OSSE study has demonstrated the beneficial impacts of the MISTiC Winds concept on global weather prediction
- A four-plane constellation has more impact than a single plane
- The most beneficial impact is from the mid-tropospheric winds derived from radiance channels that are not available from other platforms
- It is important to perform a detailed analysis of errors and their impacts
- Development of (used) radiation-transfer code in the short-wave IR is likely to lead to more beneficial impacts – this is also applicable to existing hyperspectral data
- The GMAO's GEOS OSSE suite is suited to other studies, including active wind sensing techniques